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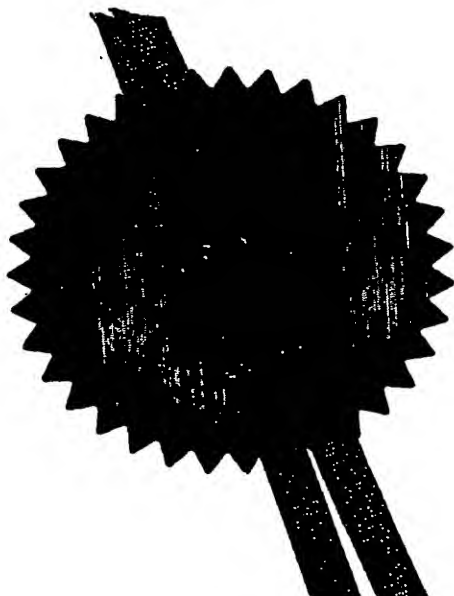
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P. Mahoney

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Request for grant of a patent



1/77

The Patent Office

Cardiff Road
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1-5 JUL 2002

1. Your reference 03 41144

2. Patent application number 0215622.2
08JUL02 E731363-2 D02094
P01/7700 0.00-0215622.2

3. Full name, address and post code of the or each applicant
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Patents ADP number

7652217003

If the applicant is a corporate body, give the country/state of its incorporation

FI

4. Title of the invention METHOD OF AND APPARATUS FOR COMMUNICATING

5. Name of your agent VENNER, SHIPLEY & CO

"Address for service" in the United Kingdom to which all correspondence should be sent

20 LITTLE BRITAIN
LONDON
EC1A 7DH

Patents ADP

1669004 ✓

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or each of these earlier applications and the or each application number

Country	Priority application number	Date of filing
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7. If this application is divided or otherwise derived from an earlier UK application, give the number and filing date of the earlier application

Number of earlier application	Date of Filing
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8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'YES' if:
a) any applicant in 3. above is not an inventor, or
b) there is an inventor who is not named as an applicant, or
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YES

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form.
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Description	<u>7</u>
Claim(s)	<u>3</u>
Abstract	<u>1</u>
Drawing(s)	<u>4 + 4 SW</u>

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Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)

Request for preliminary examination and search (*Patents Form 9/77*) 1

Request for substantive examination (*Patents Form 10/77*)

Any other documents

11.

I/We request the grant of a patent on the basis of this application.

Signature

Vener, Shipley & Co.

Date

5 July 2002

12. Name and daytime telephone number of person to contact in the United Kingdom

PAUL DERRY
020 7600 4212

Method of and Apparatus for Communicating

This invention relates to a method of communicating between first and second
 5 radio transceivers. This invention relates also to a system, and to a radio
 transceiver.

Various radio channel types exist today for use by portable radio transceivers, global
 system mobiles (GSM) speech channels, general packet radio service (GPRS),
 10 Bluetooth and wireless local area network (WLAN) being examples of such channel
 types. Furthermore, the universal mobile telephone system (UMTS) allows the
 transfer of audio-visual information in both directions between portable radio
 transceivers. The term now adapted for portable radio transceivers of the UMTS
 standard is mobile station (MS), and this term is used hereafter to describe a mobile
 15 radio transceiver capable of communicating in any system.

With many MSs being equipped to communicate with two or more different channel
 types, it has become common for a user of an MS to have to decide which type of
 communication channel to use, which can constitute an inconvenience.

20 According to a first aspect of the invention, there is provided a method of
 communicating, the method comprising: effecting communication between first and
 second radio transceivers via a telecommunications network over a first channel;
 determining the distance between the first and second radio transceivers;
 25 determining whether the distance between the two transceivers meets a
 predetermined threshold; and in response to a determination that the threshold is
 met, effecting direct mode communication between the first and second radio
 transceivers over a second channel.

30 The invention also includes a radio transceiver, comprising: a communicator for
 communicating with a remote radio transceiver via a telecommunications network
 over a first channel; a determiner for determining the distance between the
 transceiver and the remote transceiver, and for determining whether the distance

meets a predetermined threshold; and a channel charger, responsible to a determination that the threshold is met, for effecting direct mode communication ~~between the transceiver and the remote transceiver over a second channel.~~

- 5 The second channel may have a greater bandwidth than the first channel and the first and second channels may be of different channel types. The method may include, prior to the effecting direct mode communication step, estimating the quality of the second channel. The determining steps may be carried out at the first radio transceiver and the distance determination step may include determining the
10 locations of the first and second radio transceivers.

The location determination may involve a satellite-based position system or may involve triangulating from plural fixed radio transceivers, preferably forming part of the telecommunications network.

15

The direct mode communication step may be effected only if a bandwidth or other service demand exceeds the capability of the first channel.

- Moreover, the threshold can be dependent on, preferably equal to, the sum of the
20 radio coverage of the first and second radio transceivers.

- The invention also extends to a system for effecting communication between first and second radio transceivers, comprising: a communicator for effecting communication between the first and second radio transceivers over a first channel;
25 a determiner for determining the distance between the transceivers, and for determining if the distance meets a predetermined threshold; and a channel charger responsive to a determination that the threshold is met, for effecting direct mode communication between the transceivers over a second channel.

- 30 The invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a schematic drawing of a mobile station according to one aspect of the invention;

Figure 2 is a schematic diagram of a telecommunication system according to one aspect of the invention and including the mobile station of Figure 1;

5 Figure 3 is a flow chart illustrating operation of the mobile station of Figure 1; and
Figure 4 is a chart showing signalling effected according to one embodiment.

Referring to Figure 1, a first mobile station (MS) 10 comprises generally a housing 11, an antenna 12, which is connected to transmit and receive circuitry 13, and a
10 central processing unit (CPU) 14. The CPU 14 is connected to the transmit and receive circuitry 13 in four parallel paths 15-18, each path including a respective one of a Bluetooth module 19, a UMTS speech channel module 20, a WLAN module 21 and a UMTS audio-visual module 22. A database 24 containing threshold
information, also is connected to the CPU 14. Each of the modules 19 to 22 is
15 configured to allow the first MS 10 to communicate via radio over a different respective channel type. Moreover, each of the channel types has a different bit rate, which equates to bandwidth, namely around 100kb/s for UMTS speech, 1Mb/s for Bluetooth, 10Mb/s for UMTS A-V, and around 100MB/s for WLAN.

The first MS 10 optionally includes a global positioning system (GPS) receiver 23
20 which is arranged, in response to a request by the CPU 14, to determine the location of the MS, and to provide location information to the CPU. A receiver operable with another positioning system (such as Glonass or the proposed Galileo) could be used in place of the GPS receiver 23.

25 Operation of the MS 10 in a telecommunications system will now be described with reference to Figure 2.

In Figure 2, the MS 10 is shown communicating with a first base station (BS) 30 of a UMTS system 31. Second to fourth BSs on 32-34 are shown, along with their
30 respective areas of coverage (the boundaries of which are given by dotted-line circles). Second to fourth MSs 35-38, are shown in communication with various ones of the BSs 30, 32-34.

In this example, the first MS 10 is connected for speech communication with the second MS 35 over a UMTS speech channel. To this end, the first MS 10 is

connected to the BS 30 via a two-way UMTS speech channel, as is the second MS

35. Alternatively, the second MS 35 could be connected via the second BS 32, in
5 which case data would pass between the second BS and the first BS 30 via the network 31, since the second MS is within the area of coverage of both the first and second BSs. It is not important for the purpose of this embodiment which BS or BSs the first and second MSs 10, 35 are using for communication.

10 On determination that the bandwidth of the channel being used for communication between the first and second MSs 10, 35, which in this example is a UMTS speech channel, is not sufficiently high to communicate, the first MS sets a 'more
bandwidth desired' flag (not shown) to TRUE. Examples of situations in which this
15 that a higher quality of picture is required, or when it is desired to send other data, e.g. gaming data, along with normal speech call data. Another situation when this might occur is when the channel type (and hence the bandwidth) is selected by a user or the users on the basis of cost effectiveness, when a higher bandwidth channel would be desired; for example when a speech call is in progress when a
20 videophone call would be preferred. Since direct mode communication does not involve the transmission of large amounts of data over a network, it may be much cheaper than network calls, or even without charge. As long as the 'more bandwidth desired' flag remains TRUE, the software operation given by the flowchart of Figure 3 is run on the first MS 10.

25 Referring to Figure 3, the operation begins in this instance at step 40, which describes the connection status at this time. In this context, it will be appreciated that 'global connection' refers to connection via the base stations 30, 32-34 of the network 31. At step 41, the first MS 10 determines its location using its GPS
30 receiver 23, and receives information identifying the location of the second MS 35. At step 42, the positions of the two MSs 10, 35 are compared, and the distance between them calculated. This distance is then compared to values stored in a table which relate to predetermined feasibility parameters. The operation of step 42 is

performed relatively infrequently, so as to save resources, e.g. processing resources and to avoid the need for frequent sending of location and other subsidiary information over the network 31. A decision is made at step 43 as to whether the connection is potentially feasible, and return is made to step 41 if a negative
5 decision is made. Otherwise, the positions of the MSs 10,35 are compared again at step 44, and the distance between them compared to the maximum permissible distance in step 45. A threshold, which is the maximum permissible distance, is set at a value equal to the sum of the radio coverage of the first and second MSs, which coverages are made available to the first MS 10 in any suitable manner. The
10 threshold and the maximum permissible distances are stored in the database 24. This calculation is made significantly more frequently than the calculation of step 42. If the threshold is exceeded, a NO result returns the operation to step 41. If the threshold is not exceeded, a YES result causes the operation to progress to step 46. Here, direct mode communication is established between the first and second
15 MSs 10, 35 in any suitable manner. The global communication may remain in place or it may be disconnected. By step 47, local connection, or direct mode communication, is established and on.

At step 48, the first MS 10 again determines its location using the GPS receiver,
20 receives location information about the second MS 35, and determines the distance therebetween. At step 49, this distance is compared with the threshold used in step 45, and a decision made as to whether the threshold is exceeded at step 50 with a NO result returning the operation to step 48, and a YES result causing progression to step 51. It will be appreciated that a YES result is obtained from step 50 only
25 when the first and second MSs 10, 35 have moved apart so that their radio coverages no longer overlap. In this case, the operation takes the appropriate step, step 51, of switching communication from local (direct mode) to global (i.e. via at least one BS 30). If the global connection was broken at step 41, then step 50 involves establishing a global connection, in any convenient manner.

30
In a further embodiment (not shown), the switching of a global connection to a local connection is carried out only if an MS determines that a channel of sufficiently high quality can be established. This is achieved by the sending of data

from the first MS via the first BS 30 indicating the channel which is to be used, which information is then passed onto the second MS 35. The first MS 10 then transmits some test data via the identified channel, and this data is received by the second MS 35. The bit error rate (BER) of the received data is calculated in a conventional manner, and the BER transmitted to the first MS 10 either directly or using the global connection. The connection is switched from global to local at step 46 only if the first MS determines from the BER received from the second MS 35 that the propagation channel between the first and second MSs 10, 35 is of sufficiently high quality. Channel quality is determined continuously, along with the distance between the first and second MSs 10, 35, for the purpose of determining whether a switch from local to global communication should be made.

Many variations of this are possible. For example, any other measure of channel quality may be made and used for the purpose of deciding whether to switch, examples being received signal strength and packet error rate. Also, a measure of the quality of the propagation channel from the second MS 35 to the first MS 10 may be made and this may be dependent on how much data is required to be transmitted across that channel.

The operation of the flowchart of Figure 3 does not need to be carried out by the first MS 10. Although it is preferred that the operation is carried out by the MS which determines that a higher bandwidth channel of communication is desired, this operation may be carried out instead by another MS or by the BS 30 or some other part of the network 31. Running the operation of the Figure 3 flowchart other than in the first MS allows it to be of simpler design.

Reference is now made to Figure 4, which is a signalling chart having the first MS10 on the left hand side (Terminal A), the second MS35 on the right hand side (Terminal B), and the network 31 in the centre.

Referring to Figure 4, connection established signals 60, 61 are passed from Terminal A to network 31 and from there to terminal B respectively once a channel has been allocated respectively. Connected signals 62, 63 are sent from terminal B

and from the network 31, respectively, in response. Communication between the terminals A and B is then established over a first channel, as is indicated at 64. The network 31 subsequently, and while the channel 64 is still open, transfers location information to terminal B and to terminal A with signals 65 and 66. In the
5 embodiment of Figure 3, it is not necessary to send signals 65 and 66 because location information is not stored on the network 31. In other embodiments (not shown) however, a location information network (which may or may not form part of the network 31) is used to calculate and to hold information about the locations of the MSs 10 and 35, and this information is passed to one or both of the MSs
10 before direct-mode communication can be established. Identification and location information, as well as any other required information, is then passed between the terminals by signals 67 to 70. Afterwards, direct mode communication is established by the sending of a connection establishment signal 71 directly from terminal A to terminal B and by a communication signal 72 sent in reply. Direct
15 mode communication is then established at 73.

The location of the first and/or second MSs 10, 35 may be determined in any suitable manner, such as by triangulating signals from plural base stations of known locations as is known. The triangulation calculations may be carried out by the
20 network 31 or by the relevant MS 10, 35.

Location information for each MS may be stored by the network 31, and be accessible by any station as and when required. Location information may be transmitted to an MS by SMS message, which is particularly convenient since SMS messages can be received without interruption of any ongoing speech call.
25

In an alternative embodiment (not shown), the second channel has a bandwidth equal to or less than the first channel.

Claims

1. ~~A method of communicating, the method comprising:~~

effecting communication between first and second radio transceivers via a
5 telecommunications network over a first channel;

determining the distance between the first and second radio transceivers;

determining whether the distance between the two transceivers meets a
predetermined threshold; and

10 in response to a determination that the threshold is met, effecting direct
mode communication between the first and second radio transceivers over a second
channel.

2. A method as claimed in claim 1, in which the second channel has a greater
bandwidth than the first channel.

15 3. A method as claimed in claim 1 or claim 2, further comprising, prior to the
effecting direct mode communication step, estimating the quality of the second
channel.

20 4. A method according to any preceding claim, in which the determining steps
are carried out at the first radio transceiver.

5. A method according to any preceding claim, in which the distance
determination step includes determining the locations of the first and second radio
25 transceivers.

6. A method as claimed in claim 5, in which the location determination involves
a satellite-based position system.

30 7. A method as claimed in any of claims 1 to 5, in which the location
determination involves triangulating from plural fixed radio transceivers, preferably
forming part of the telecommunications network.

8. A method as claimed in any preceding claim, in which the first and second channels are of different channel types.

9. A method as claimed in any preceding claim, in which the direct mode
5 communication step is effected only if a bandwidth or other service demand exceeds the capability of the first channel.

10. A method as claimed in any preceding claim, in which the threshold is
10 dependent on the sum of the radio coverage of the first and second radio transceivers.

11. A radio transceiver, comprising:
a communicator for communicating with a remote radio transceiver via a
15 telecommunications network over a first channel;
a determiner for determining the distance between the transceiver and the remote transceiver, and for determining whether the distance meets a predetermined threshold; and
a channel charger, responsible to a determination that the threshold is met,
20 for effecting direct mode communication between the transceiver and the remote transceiver over a second channel.

12. A radio transceiver as claimed in claim 11, in which the second channel has a
25 greater bandwidth than the first channel.

13. A radio transceiver as claimed in claim 11 or claim 12, further comprising an estimator arranged to estimate the quality of the second channel.

14. A radio transceiver as claimed in any of claims 11 to 13, including a satellite
30 positioning receiver, arranged to calculate the location of the transceiver.

15. A radio transceiver as claimed in any of claims 11 to 14, in which the first and second channels are of different types.

16. A system for effecting communication between first and second radio transceivers, comprising:

5 a communicator for effecting communication between the first and second radio transceivers over a first channel;

a determiner for determining the distance between the transceivers, and for determining if the distance meets a predetermined threshold; and

10 a channel charger responsive to a determination that the threshold is met, for effecting direct mode communication between the transceivers over a second channel.

17. A communication method substantially as hereinbefore described with reference to the accompanying drawings.

15 18. A communication system substantially as hereinbefore described with reference to the accompanying drawings.

19. A radio transceiver substantially as hereinbefore described with reference to the accompanying drawings.

Abstract

Method of and Apparatus for Communicating

A system for effecting communication between first and second radio transceivers,
5 comprises a communicator for effecting communication between the first and
second radio transceivers over a first channel; a determiner for determining the
distance between the transceivers, and for determining if the distance falls below a
predetermined threshold; and a channel changer responsive to a positive
determination, for effecting direct mode communication between the transceivers
10 over a second channel

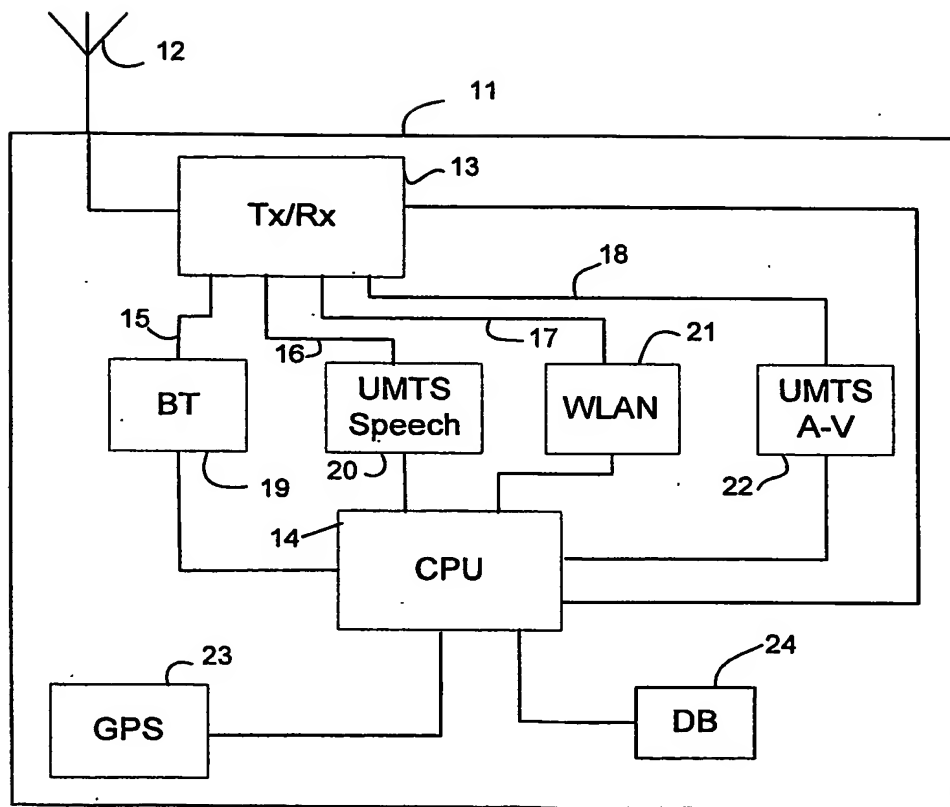


FIG. 1

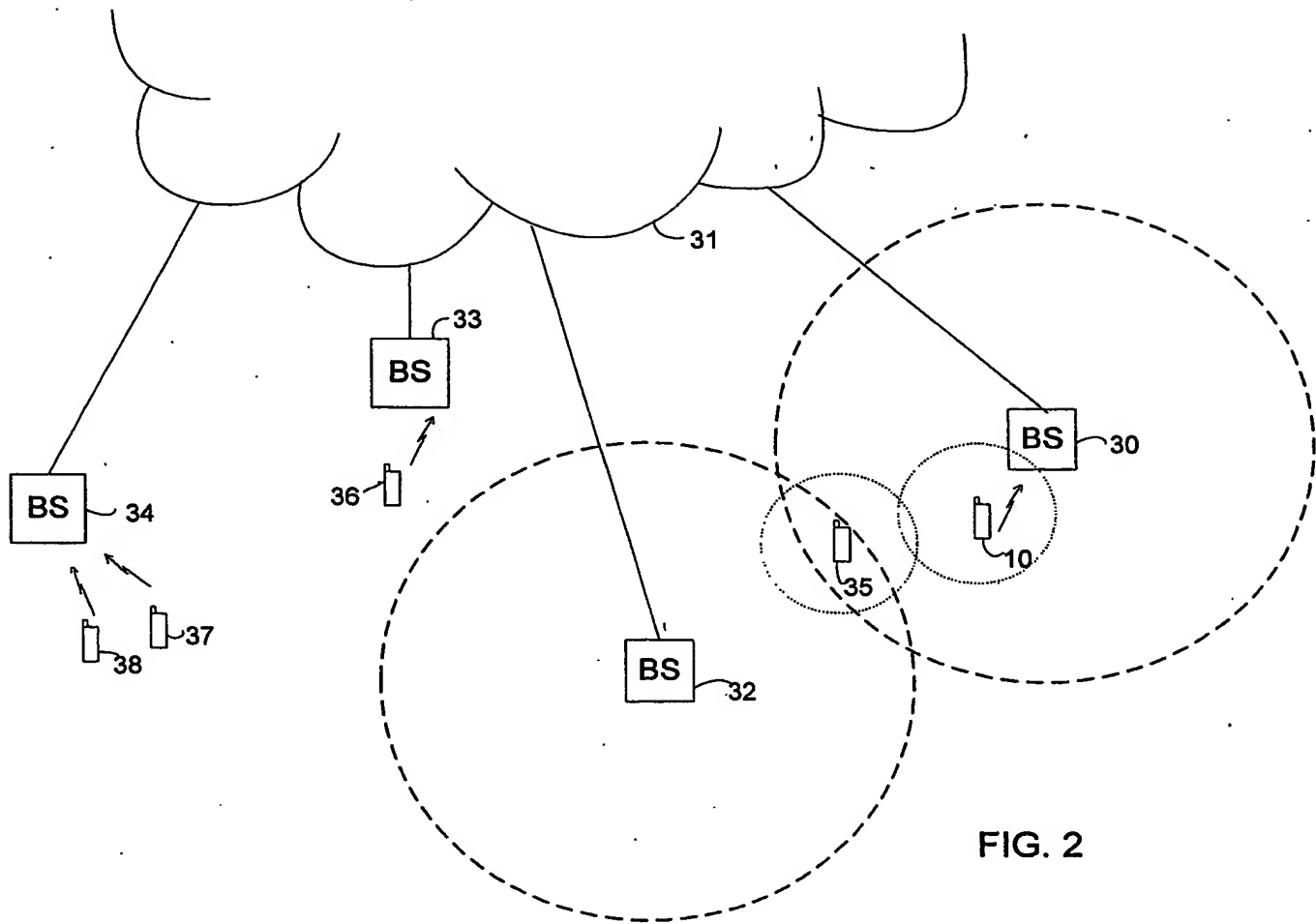


FIG. 2

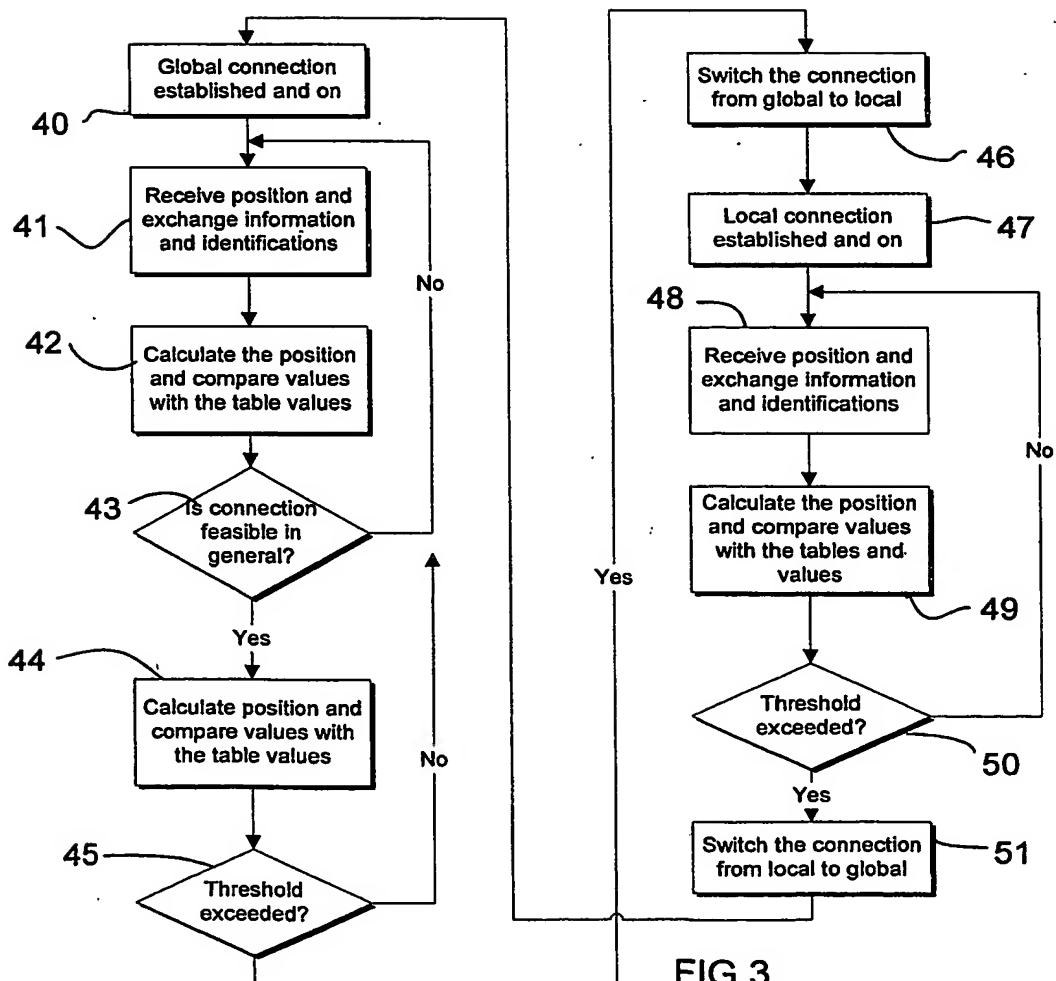


FIG.3

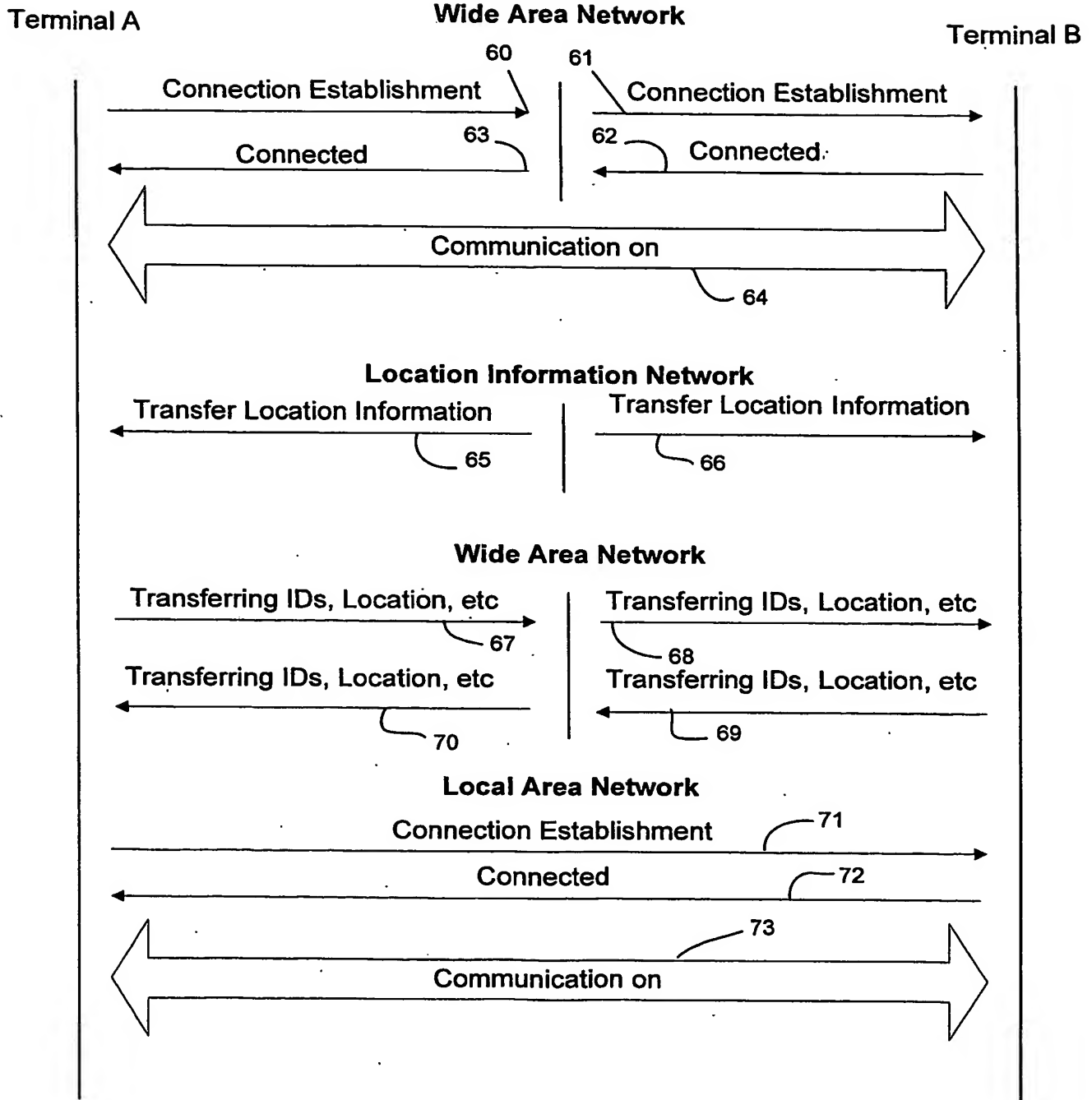


FIG. 4